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BY PAUL SHOUP.

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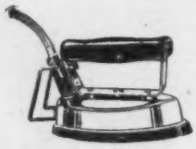

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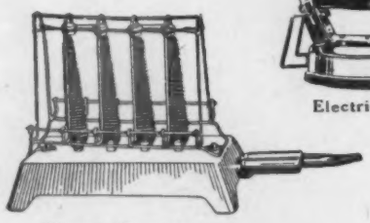

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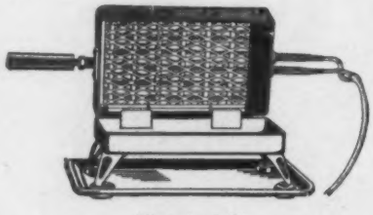

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ELECTRIC RAILWAY CONDITIONS IN CALIFORNIA

BY PAUL SHOUP.

(After concisely stating the facts about the plight in which the electric railways find themselves, Mr. Shoup clearly analyzes the causes and suggests the remedy. This is the text of an address before the Jovian Electrical League at Los Angeles, October 21, 1915. The author is president of the Pacific Electric Railway.—The Editor.)

I am going to ask some questions today because I understand the Jovians always have the answer. I was told they acquired this habit from Mr. Edison, who illuminates everything. Thomas A. Edison arrived a long time back. He has been one of our stars in the world constellation that has grown brighter with time. He did a great deal in making electricity a condition rather than a theory to confront us. He has helped more than any other living man to light the pathways of people through life.

But there are some questions that Mr. Edison has left unanswered. There are some questions that it takes a whole community to answer; some, the entire state, and occasionally a whole nation is required to give a reply.

The falling water of the Sierra Nevada three hundred miles or more away, lights your houses, takes you to and from home. turns the wheels of your industries. But this miracle has brought with it problems.

Costly Construction on Line of Pacific Electric Railway Near Los Angeles.

These problems lead to the questions that can be answered by no one person and can be satisfactorily answered only when understood by the public.

These questions necessarily present a sober side of the situation confronting the electric railways under present conditions.

This question concerns us all: What is to be the future of the electric railways in California?

Into these enterprises have been poured several hundreds of millions of dollars. The resulting railways have been, and are, great assets to the communi-

ties they serve. Sections without such service want it; sections that have it will not willingly give it up. It has been stable, efficient, dependable.

But conditions have changed. This question therefore now directly concerns every such section because its own interests are at stake, if for no other reason.

The answer is of vital importance to the employe, the stockholder, the bond holder and those dependent upon these three classes; and important to those who have business relations therewith, whether the storekeeper selling merchandise to an employe, the power company selling power to move the cars, or the savings bank official lending depositors money upon railway securities.

The electric railways of the state are not doing well. This is not a happy statement. It is the very opposite to the one that I would like to make, but it is the truth. To get right, facts must be stated. The public must understand them, and then, if conditions are to be remedied, help us right them.

The Facts.

Before dealing with the causes of this condition, let me submit facts as to the situation. Herewith are statements of the operating revenue for each of the last three fiscal years of 22 electric railways of California showing their gross operating revenues, the deductions for operating expenses and taxes, and finally the net operating revenues, out of which interest and other income deductions are to be paid, if there be enough revenues. In the majority of cases in the State of California, the revenues are insufficient.

So far as I know, out of twenty-five roads, twenty-two here represented, just one electric railway paid a dividend to its stockholders last year and that had no bonded debt. There may have been another one or two, but I do not know them. The figures that follow show not the conditions of one road for one year but comparative conditions for three years.

Bakersfield and Kern Electric.

	1912-13	1913-14	1914-15
Railway operating revenue	$107,983	$108,066	$ 68,541
Railway operating expenses and taxes	73,546	71,589	65,539
Net operating revenue	$ 34,437	$ 36,477	$ 3,002

During the latter part of 1915 this line's earnings did not meet its operating expenses. It didn't take in enough money to pay for its power, wages, taxes, track maintenance and other operating expenses it had actually to meet from day to day.

Humboldt Transit Company.

	1912-13	1913-14	1914-15
Railway operating revenue	$ 86,171	$ 90,850	$ 85,668
Railway operating expenses and taxes	84,269	88,689	88,917
Net operating revenue	$ 1,902	$ 2,161	*$ 3,249

* Deficit.

It will be observed that this line failed to earn its operating expenses and taxes.

Pacific Gas & Electric Company.
(Sacramento.)

	1912-13	1913-14	1914-15
Railway operating revenue	$560,578	$577,161	$498,495
Railway operating expenses and taxes	372,075	385,383	368,459
Net operating revenue	$188,503	$191,778	$130.036

The manager informed me last spring that it had practically reached the point where it had to spend all it took in.

Visalia Electric Railroad Company.

	1912-13	1913-14	1914-15
Railway operating revenue	$ 75,506	$ 98,162	$ 98,736
Railway operating expenses and taxes	75,889	93,175	91,954
Net operating revenue	*$ 383	$ 4,987	$ 6,782

* Deficit.

Increase due entirely to freight traffic. Passenger traffic decreased heavily.

Fresno Traction Company.

	1912-13	1913-14	1914-15
Railway operating revenue	$212,455	$240,973	$231,331
Railway operating expenses and taxes	155,108	176,169	193,706
Net operating revenue	$ 58,347	$ 64,804	$ 37,625

San Diego & Southeastern Railway Company.

	1912-13	1913-14	1914-15
Railway operating revenue	$428,694	$365,703	$305,433
Railway operating expenses and taxes	394,320	361,160	368,279
Net operating revenue	$ 34,374	$ 4,543	*$ 62,846

* Deficit.

This line in startling fashion represents the results of new conditions, the net revenue, $34,000 in 1912-13, last year became a deficit of $63,000.

Union Traction Company.

	1912-13	1913-14	1914-15
Railway operating revenue	$ 88,003	$ 81,033	$ 69,377
Railway operating expenses and taxes	59,120	58,117	48,947
Net operating revenue	$ 28,883	$ 22,915	$ 20,430

Union Traction Company's net revenue fell off in two years about 30 per cent. It has been unable to meet its interest obligations and the bond holders have been recently called together to decide what to do.

Northern Electric Railway.

	1912-13	1913-14	1914-15
Railway operating revenue	$866,427	$872,391	$826,230
Railway operating expenses and taxes	582,610	735,354	746,952
Net operating revenue	$283,817	$137,037	$ 79,278

The Northern Electric Railway is in the hands of a receiver. Its net operating revenue fell from $283,000 two years ago to $79,000 during the year just closed. Allowing for some accounting adjustments, the decrease is yet very startling.

Stockton Electric Railroad Company.

	1912-13	1913-14	1914-15
Railway operating revenue	$191,489	$209,652	$200,127
Railway operating expenses and taxes	119,065	138,758	140,684
Net operating revenue	$ 72,424	$ 70,894	$ 59,443

Ocean Shore Railway Company.

	1912-13	1913-14	1914-15
Railway operating revenue	$281,096	$264,050	$267,014
Railway operating expenses and taxes	255,329	208,502	307,976
Net operating revenue	$ 25,767	$ 24,452	*$ 40,961

* Deficit.

Riverside, Rialto & Pacific Railroad.

	1912-13	1913-14	1914-15
Railway operating revenue	(Incomplete)	$ 93,833	$ 71,606
Railway operating expenses and taxes	"	65,793	55,596
Net operating revenue		$ 28,040	$ 16,010

Petaluma and Santa Rosa Railway Company.

	1912-13	1913-14	1914-15
Railway operating revenue	$308,165	$303,645	$298,224
Railway operating expenses and taxes	207,905	211,706	222,832
Net operating revenue	$100,260	$ 91,939	$ 75,392

Oakland, Antioch & Eastern Railway.

	1912-13	1913-14	1914-15
Railway operating revenue			$541,904
Railway operating expenses (taxes not shown)			412,989
			$128,915

The Oakland, Antioch & Eastern Railway is too young to make any comparative statements, but the stockholders already have had to meet several assessments.

United Railroads of San Francisco.

	1912-13	1913-14	1914-15
Railway operating revenue	$8,589,248	$8,515,894	$8,030,275
Railway operating expenses and taxes	5,159,029	5,226,537	5,273,827
Net operating revenue	$3,430,219	$3,289,357	$2,756,448

The United Railroads of San Francisco have suffered a decrease of nearly $700,000 in two years in its net revenue.

Peninsular Railway Company.

	1912-13	1913-14	1914-15
Railway operating revenue	$280,319	$294,172	$292,494
Railway operating expenses and taxes	239,651	287,532	279,507
Net operating revenue	$ 40,668	$ 6,640	$ 12,987

San Jose Railroads.

	1912-13	1913-14	1914-15
Railway operating revenue	$366,952	$358,711	$346,547
Railway operating expenses and taxes	266,096	266,014	268,509
Net operating revenue	$100,856	$ 92,697	$ 78,038

This statement does not take into consideration accident payments it had to meet, which were unusual in nature.

Los Angeles Railway.

	1912-13	1913-14	1914-15
Railway operating revenue	$6,821,756	$6,997,795	$6,323,086
Railway operating expenses and taxes	5,156,957	5,183,434	4,738,407
Net operating revenue	$1,664,799	$1,814,361	$1,584,679

Pacific Coast Railway Company, Electric Lines.

	1912-13	1913-14	1914-15
Railway operating revenue	$ 24,750	$ 26,007	$ 12,531
Railway operating expenses and taxes	11,356	13,008	10,058
Net operating revenue	$ 13,394	$ 12,999	$ 2.437

Pacific Electric Railway Company.

	1912-13	1913-14	1914-15
Railway operating revenue	$9,399,080	$9,467,483	$8,874,507
Railway operating expenses and taxes	6,743,427	7,100,572	6,533,741
Net operating revenue	$2,655,653	$2,366,911	$2,340,766

On Line of Oakland, Antioch & Eastern Railway.

San Francisco-Oakland Terminal Railways.

	1912-13	1913-14	1914-15
Railway operating revenue	(not given)	$4,515,799	$4,341,891
Railway operating expenses and taxes	"	3,168,921	3,097,611
Net operating revenue		$1,346,878	$1,244,280

The Panama-Pacific Fair gain in traffic, did not offset other losses up to June 30th.

Glendale & Montrose Railway.

	1912-13	1913-14	1914-15
Railway operating revenue	$ 7,024	$ 17,700	$ 18,547
Railway operating expenses and taxes	11,595	28,813	33,675
Net operating revenue (deficit)	$ 4,571	$ 11,113	$ 15,128

The railway that serves Glendale, Montrose and La Crescenta didn't earn its operating expenses and taxes last year by $15,000. But. would the commonwealth served, give it up willingly?

Monterey & Pacific Grove Railway.

	1912-13	1913-14	1914-15
Railway operating revenue	$ 43,307	$ 39,942	$ 34,432
Railway operating expenses and taxes	30,148	29,678	30,526
Net operating revenue	$ 13,159	$ 10,264	$ 3,906

This company is in the hands of its bond holders.

San Francisco, Napa & Calistoga Railway.

	1912-13	1913-14	1914-15
Railway operating revenue	$215,425	$224,003	$215,898
Railway operating expenses and taxes	129,313	174,723	166,529
Net operating revenue	$ 86,112	$ 49,280	$ 49,369

There are a few roads in the state not included in the above statement. The San Diego Electric Railway figures are not yet available. The Tidewater & Southern is too young to make any comparisons, but its passenger revenue showed decrease of 20 per cent January to August compared with same period last year. The Central California Traction Company advises their figures are not yet available, but they show heavy decrease in earnings and a deficit in revenue necessary to meet fixed charges.

The figures quoted above are accurate. They are from accounts kept under classifications prescribed by the Interstate Commerce Commission or the State Railroad Commission.

Changes in classification during the last three years have tended to show an increase in operating expenses in some directions and decreases in others.

Operating expenses have been increased also in connection with such work, which is entirely proper, as valuing the roads of the state.

It is also proper to say that with some lines, such as the Fresno Traction and the Stockton Electric, new lines have been built into undeveloped territory and operating expenses thus increased without corresponding gain in revenue as yet, these lines being

protected by cash bonuses which do not appear in revenue accounts.

While in some instances the railways have materially reduced expenses, in others they have not been able to do so. Service is often governed by franchise contracts when it does not directly pay.

Uncontrollable expenses, such as taxes, paving maintenance, the operation of safety devices, that cost of reconstruction chargeable to operating expenses, have increased, and the railroads have been powerless to prevent such increases.

You may say, in scanning these figures, that while there are material reductions in gross earnings of the roads during the 3 year period and marked reductions in the net earnings, yet these are not such as to imperil the properties.

This possibly would be true were it not for two facts:

First, that three years ago the interurban roads as a whole, and a number of the city lines, were not earning their fixed charges. They could afford to lose but little.

Second, (and very serious) practically all of the roads have, in the 3 year period, had to invest large sums of money because of public requirements, such as in paving and that part of track reconstruction incident to paving which, under the classification, is charged to investment. They have had, also, because of the demand for improved type of equipment, in many cases to replace the older and cheaper cars with newer and much more expensive rolling stock. There has been a very considerable investment made in safety devices, such as block signals, interlocking plants, crossing warning signals, and the like.

I will not trouble you today with the final results of last year's operations of the electric railways after they paid the interest on the debt, they owe and made the other necessary deductions from their net incomes, and you can forget the question of dividends to stockholders because, as I have stated, the stockholders of the electric railways of the state would for the most part be astonished to get any dividends.

Then I can't really make you a statement as to the electric railways paying the interest on the debts they owe out of their incomes because generally their incomes are not sufficient to meet such interest. The result is that some of them are in the hands of their creditors and, in other cases, the stockholders are carrying the road.

In this connection, I want to make you the following statements:

The interurban electric railways of this state are not now and have not during any one of the three fiscal years ending June 30, 1915, earned interest and other fixed charges upon the investment, and in saying investment, you can put it this way: the money actually put into the properties and properly chargeable under Interstate Commerce Commission classification to capital account; or the actual interest they have to pay upon all the debts they owe, represented by funded and floating debts; or the reproduction costs of the properties today, putting the rights of way and other real estate, not at the reproduction costs, but at the original costs to the companies. I make this statement this way because I do not want anyone to come back with the reply that the investment represents a lot of water or hot air or anything else intangible.

The city lines are not much better off. I believe I could make the same statement with reference to them, but their final income accounts for last year are not at hand, nor am I so familiar with these city properties as a whole as I am with the interurban railways. It can be stated with certainty that they are not prosperous.

For the three-year period I have mentioned, millions of dollars have been paid in for improvements, such as extensions, new rolling stock and additions and betterments. It may be stated that, as an example, the Pacific Electric's decrease in net earnings is not out of keeping with the general conditions, but I will remind you that in the three years we have extended our lines and invested millions of capital. Nor are these new lines the burden that you might suppose. Analysis shows that many of them are doing better than the old in proportion to the investment, because not so subject to automobile competition or paving charges.

It can be stated with certainty that more than two-thirds of the electric railway companies of California did not earn their fixed charges last year.

This is a serious situation. It is serious to every community that is served by electric roads as well as to the employes and owners. It is serious to every community that would like to have electric railway service.

Up to a very few years ago the electric roads were making fair progress. They are not now. The exposition travel this year, up to June 30th at least, did not offset the loss through certain causes.

The Causes.

The next question to be asked is, what are the causes?

Some are uncontrollable. Some are those that other lines of business have to meet.

The first of these is the business depression. We face that cheerfully; it is a condition which will pass. California always comes back into its own.

The second is the development of the automobile and the extension of the good roads.

As to privately owned and operated machines we face this automobile development without complaint. It is a new and permanent factor. We either can or cannot live with them. They have made serious inroads upon our earnings. They present a condition that we have to face.

Likewise we have no fight upon the good roads. They are a great asset to California. In the end the state will reap great benefit.

But it is to other causes that I most earnestly direct your attention.

Paving. Francises in the old days were taken when the contract to maintain the section of the street occupied was not such a tremendous burden as it is now, nor was the street subject to the use of other vehicles taking from the electric lines so much of their revenue as is now the case. But with the advent of the automobile cutting into our revenue came the demand for better streets. People are not satisfied with the light paving as of old. Electric railways are

under obligation to pave the space occupied by the tracks and for two feet outside thereof as a rule with the same material and under the same specifications as the remainder of the street is paved. The public is likewise demanding the use of heavier rails, either high "T" rails or grooved rails. It is necessary to have concrete foundations and thicker wearing surface.

Under the present Los Angeles city specifications, and this is simply to meet the demands of traffic, it costs at least $20,000 per double track mile on an average just to pave the space occupied by the electric railways, and sometimes, depending on track centers, much more.

There has been no such increase in earnings as to justify this increase in investment. When we pave a street now we have, as a rule, to take up existing tracks and their value is only salvage value. The road has to be reconstructed and, independent of paving, at a far greater cost than that at first involved.

We are asked to do this under limited term franchises. We put in tremendous investments where there is no possibility of getting any considerable part of our capital back before the expiration of the franchises. Just one concrete example will suffice to illustrate this situation.

The Pacific Electric is now paving a section of Santa Monica Boulevard to the city limits. The distance is a little over two miles. The cost to us for this work is $225,000, according to the work order estimate, or over $100,000 a mile. The asphalt paving will cost us approximately $70,000.

If you were an investor, could I justify to you this investment on the basis of the franchise expiring in thirty years, and also dependent upon connecting franchises expiring in much shorter time? With operating expenses and taxes, on the average, taking over seventy per cent of our revenue, could I prove to you that this investment would be a desirable one? Especially as this is in the further limits of the five cent fare territory and the rate per passenger is very low, probably not in excess of a cent. You can determine for yourselves what tremendous gross earnings and how many passengers would have to be handled in order to make this a profitable investment.

Now the public is demanding this kind of construction, not only in this city, but in every city in California, and because of a very natural demand for good streets. But the question is, with decrease in revenue through automobile competition, both privately and publicly operated, can the electric railways find the money to do this work? Is it right for them to risk other people's money in such an investment?

Locally, because of the enterprise in making good streets in Los Angeles and in neighboring cities, both the Pacific Electric and the Los Angeles Railway have had to make tremendous investments for reconstruction, independent of their charges to operating expenses.

The taxes paid by the electric roads have always been very heavy. If it takes two-thirds of the revenue to meet operating expenses, you will readily see what a large proportion of the net earnings taxes are. Out of each dollar revenue, we now pay 5¼c to the state. This represents increases in the last few years as follows, in percentage:

Year.	Percentage to State.	Increase Over Previous Year.
1913	4 per cent	17.8 per cent
1914	4¾ per cent	26.2 per cent
1915	4¾ per cent	3.9 per cent
1916	5¼ per cent	12. (estimated)

The Pacific Electric Railway last year paid on its operating properties $496,477 in taxes. Thus, of the money it had left after paying its operating expenses, more than 17 per cent went to taxes. Incidentally, it may be stated that the Pacific Electric did not earn its interest and fixed charges by half a million dollars.

The third cause is the greatly increased expenses due to the very proper precautions the electric railways are taking in connection with the **"Safety First"** movement. This includes installation and operation of safety devices, such as interlocking plants and signal systems, training schools, flagmen and in the operations all along the line a higher standard. Wages on practically all of the interurban lines and upon a great many of the city lines have been increased in the last three years.

No one has fault to find with these measures, but they involve expenses that must be met by increasing revenues.

The fourth cause is the **jitney** and motor truck competition. This, of the causes that can be controlled by the public, is most important of all. What I have stated before I will state again in this connection, that is, that if these carriers are to take over our business or any part thereof, then they must take over likewise our obligations and responsibilities to the public. This is not true now. Jitneys in the cities are beng regulated, but they have no such obligations yet as the electric lines have. They have no such taxes in proportion to their gross incomes. They do not pay for streets; in fact, they run over the streets created and maintained in large part by the electric railways. They can run at the times and under the conditions most favorable to them with none of the obligations with respect to fares that we have.

The interurban jitneys are practically not regulated except as they come in contact with city regulation. They have developed no new territories. They take the more profitable single and round trip business but do not take care of the home-maker who wants an individual commutation ticket. But these various lines in many directions, city and interurban, are taking enough of the narrow margin in earnings that the electric railways have to threaten their investments and threaten their efficiency as carriers. It is idle to prove that a jitney is not an economic possibility. It is here just the same.

There are other causes tending to decrease revenues and increase expenses, but they are minor ones. I believe the public is learning that the labor is worthy of its hire and that the rates of the electric railways must be sustained or they cannot give the service.

The Remedy.

The next question you naturally ask is, assuming what has been said to be correct, what is to be done about it?

What is to be done depends largely upon the understanding, co-operation and final good judgment of the public. The difficulties that we have to face in

common with the public, we will cheerfully face, but there are other directions where the public can help us and thereby help itself. We ask this co-operation in support of the service that the electric railways give and of the rights that the employes and investors should have.

If the situation be not changed, the electric railways of this state cannot improve and extend their properties. It is of value to the community as a whole to have a comprehensive service, but if present conditions continue, service must be curtailed and the weakest branches abandoned. This is not a matter of theory; lines have been abandoned already. For the stronger lines, even with unregulated competition and having to bear heavier burdens, are no longer able to carry the weak lines.

There will have to be material reduction in other directions wherever reductions can be demonstrated as saving more money than is lost through such reductions.

This means a curtailment of employment on cars, in shops, on tracks, and in new construction. Not only do these men suffer, but the business of the whole community suffers.

Commutation rates have in many directions been made because it meant the settlement of the country and the creation of individual and round trip traffic at higher rates. The head of the family would buy a monthly commutation ticket; the others would ride on higher priced tickets. But if jitneys are to come in and, without making commutation rates, enjoy the higher priced traffic, then there will have to be a readjustment of the lower rates.

There are 8000 people employed by the electric railways in Los Angeles; indirectly, I presume, another 8000 derive their living from these two systems. Counting those dependent upon them, there are thirty or forty thousand people, outside of the bond holders, who would be deprived of their livelihood if these electric railways vanished tomorrow. There are several hundred thousand people in the state who have a like interest.

The people of this community know to what extent home values and other values rest upon the substantial service given by the electric roads. You know what impairment of their efficiency means.

What, then, do we expect as electric railways?

Let me make statements from which you can draw your own conclusions.

1. I believe the electric railways in the state in behalf of the people whom they serve, as well as the people whom they employ, and those whose money they have invested have a right to ask that competition whether or not of jitney or motor trucks be asked to take on equal responsibility and obligations to the public with the electric railways.

2. You would not expect one electric road to parallel another, or to take another line's passengers from its stations, but this is exactly what automobiles are doing in California. There is not often business enough for two substantial, dependable services. It is therefore very necessary in the interest of service alone to consider under what conditions this question of competition with the electric railways by jitneys should be allowed.

3. The electric railways have reached their limit under present conditions as to taxation. This is a very hard problem with which the state is wrestling at this time. While earnings are being diminished taxes upon our gross income have been increased. Every dollar diverted from an electric road to an automobile, freight or passenger, means a loss of 5¼ cents to the state, and ordinarily, if within the city, some loss to the city likewise.

4. The electric roads will be unable to get money any longer to pave streets where poor earning lines exist. It is going to be a choice of abandonment under present conditions or modification with respect to paving expenses. I am glad to say that some of you are already realizing this, and where traffic is not heavy are permitting us to use less expensive pavement and not demanding that track be reconstructed.

5. Electric railways are in a quandary as to the rate situation, as I have already stated. The public generally is realizing that the railways must have revenues if they are to live, and Southern California has been showing in this direction an intelligent appreciation of the conditions.

This is a blue picture I am presenting to you on a bright day, but if we have troubles in common and they are to be removed, and can only be removed by co-operation of all concerned, then the facts must be published. In my judgment the electric railways can continue to give good service and to expand if the present difficulties can be overcome, and this with fairness to the public. I believe they can be. I do not want you to accept this as a pessimistic talk, because I am not pessimistic, but a statement of the situation which must be known and considered if the constructive optimism, which has made the electric railways of this state, is to be upheld by the people who have been most benefited, the public of this state. These questions that are to be replied to are not party questions nor political questions at all, they are questions to be answered by the thinking public expressing its conclusions through governmental channels. I leave these questions with you.

The metric system and decimal coinage are now being strongly advocated in England as a substitute for the awkward system of weights, measures and coins which have been so long in use. The Electrical Review of London has started a campaign to this end, believing that the return of peace will afford an ideal and unique opportunity to bring about the needed reform.

The concentration of business in the small area of a city's business section has been made possible only by such engineering developments as the modern office building, with its telephones and elevators. Without steel-frame construction high buildings would be impossible, but without the electric elevator and the telephone they would be untenable. The elevator mileage of the great cities of the country is greater than the street railway mileage. If all the messages transmitted by telephone to and from a city skyscraper had to be carried by messengers the requisite elevator facilities would occupy the entire area of the building.

MIDWAY NATURAL GAS TRANSMISSION LINE.

(Concluded.)

Main Transmission Line Between Taft and Glendale.

The main transmission line of the Midway Gas Company designed and built in 1912 by J. G. White & Company, at a total cost of $1,500,000, carries the gas from the compressor station at Taft to the West Glendale terminal, whence, after being measured and reduced to the desired pressure, it is delivered to the distributing companies.

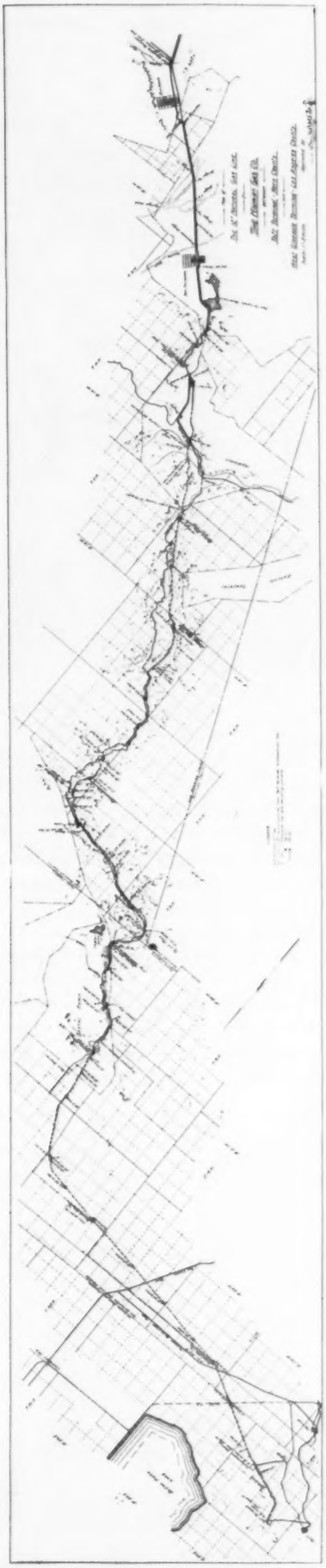
The general route of the Midway main line is shown on the map, its total length being 107.2 miles. This scenic route frequently attains an altitude of nearly 5000 ft. and was chosen by the State Highway Commission in the construction of the Ridge Highway between Los Angeles and Bakersfield. The building

Rough Country Traversed by Line.

of this highway necessitated the removal, in many instances, of the pipe line to points several feet distant. It is of interest to state that the fuel for the machinery used by the contractors was natural gas furnished by the Midway Company from its main line, at whatever point the men might be working.

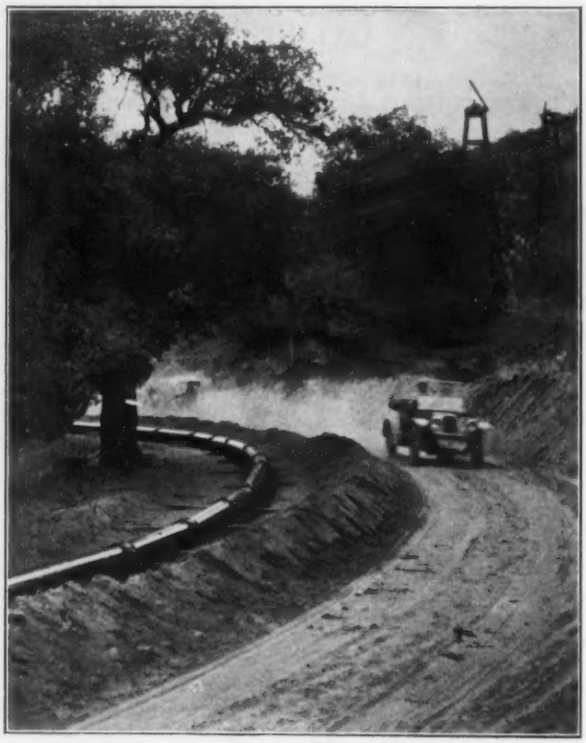
The single line is constructed of 12¾ in. outside diameter, ¼ in. thick, 31 lb. lapwelded steel pipe. The joints are made by using the Hammon all steel coupler for plain end pipe. This coupler consists of a center ring about 7 in. wide with a follower ring on each side, similar to the gland of a stuffing box on a steam engine. Between each follower ring and the center ring a packing material is inserted and pressed in position by bolts extending through the follower ring and drawing same together. This forces the packing material against the outer wall of the pipe and makes a gas tight joint. The ends of the two joints butt together at the center of the central ring. Where the surface contour is level, the average length of a joint is 36 ft. Where the contour is rough, as in the mountain section, joints averaging 18 ft. are used.

Along the route of the Midway line patrol stations are located at Lebec, Liebre Atmore, Castaic, Newhall, and Glendale, and from these points the line is constantly inspected and necessary repairs made, without



Map of Gas Transmission Line.

Washout Which Exposed Gas Line.



Pipe Line, showing 30 Degree Curve.

causing serious interruptions to service. Along the entire route of the pipe line, a private telephone is operated. Each patrol station has a telephone and each patrol and repairman carries a portable telephone which can be connected at any point. Telephone operators are maintained throughout the 24 hours at both Taft and Glendale terminals and pressures and trouble can be reported at any time.

At Glendale the pressure is reduced by means of high pressure gas regulators, which maintain any desired pressure on the supply lines to the distributing companies in Los Angeles and outlying districts. At Glendale terminal the gas is again measured to the distributing companies and the difference between the total measurement at Taft terminal, and the Glendale terminal, less that amount used enroute, at the compressor station and by other consumers, constitutes the loss of gas in transmission. This computation is made daily by the terminal operators, and any sudden increase in loss indicates a leak which is usually found and repaired within a very short time.

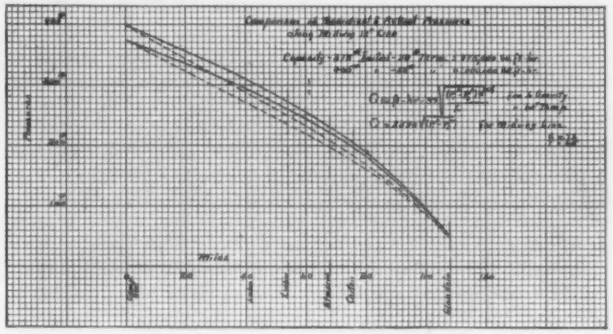
Repairing Leak with Bond Coupling.

Pressures along the line are reported each hour and a record maintained at both Taft and Glendale terminals. Pressure instructions to the compressor station are issued by the Taft terminal operators and are for the purpose of maintaining the correct discharge pressure at the station at all hours. The maximum allowable pressure to be carried on the Midway 12 in. line at the compressor station has been fixed at of 400 lb. The required terminal pressure at Glendale, needed to supply an adequate quantity of gas to the distributing companies, is 50 lb. per sq. in.

These figures limit the capacity to a maximum rate of flow of 1,000,000 cu. ft. per hour delivered at Glendale. Inasmuch as the consumption is not maintained at a uniform rate it is not possible to realize this maximum capacity per 24 hours daily. The maximum delivery per day under most favorable conditions would be about 20 million feet, and the average maximum would be about 18 million feet.

The accompanying curves show the pressure drop along the line from the compressor station to Glendale. The effect of altitude in the mountain section, beginning at Tejon Canon and extending south to Castaic is noticeable in the actual gauge readings, especially when any section is shut in and the pressure allowed to equalize along that section. The curve shows the theoretical pressure at various points and the actual observed pressures. This effect tends to

reduce the pressure in the mountain section about 20 lb. below theoretical and allows the pipe line to operate under low pressures, which is a decided advantage in rough country.



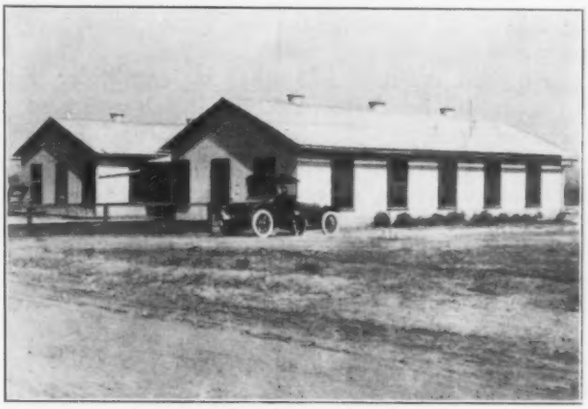
Curve of Pressure Drop Along Line.

West Glendale Terminal.

At West Glendale the pressure is reduced and maintained, the gas measured and a close watch kept on the condition of the line.

The main line pressure at this point varies from 50 to 200 lb., depending upon the time of day and the rate of consumption. Not more than 75 lb. pressure is allowed on the lines inside of the city limits, regulators being used to reduce the main line pressure to approximately 50 lb.

The station contains a duplicate set of regulators and meters, one set for each of the two main distributing companies. The measurement at Glendale is the basis for billing each company with the amount of gas delivered.

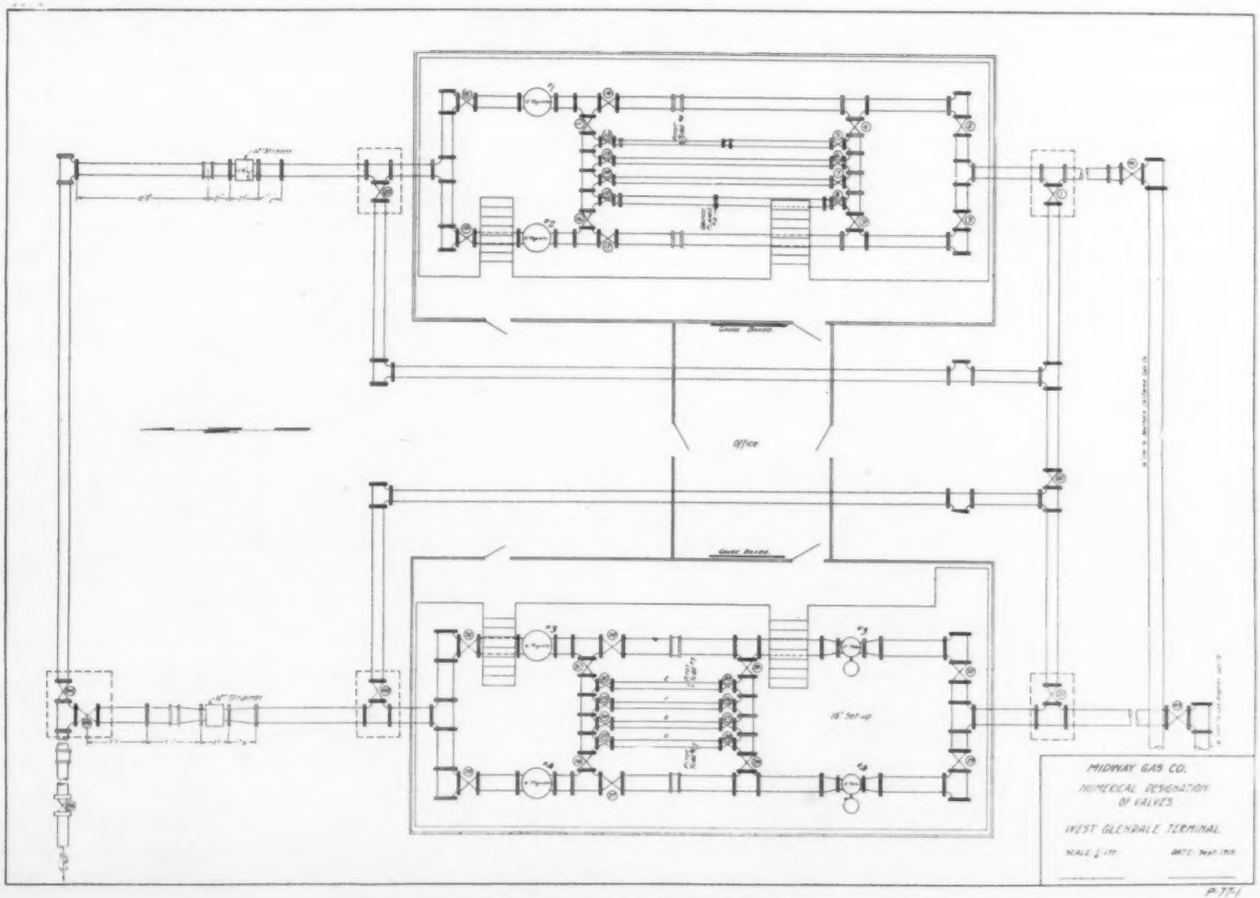


Glendale Terminal.

At both the Taft and Glendale terminals an operator is on duty every hour of the day and all business along the line is conducted by these terminal operators. They also maintain an hourly pressure record and see that all troubles, either on telephone or pipe line, are promptly reported to the proper crew, so that repairs can be made without delay.

Distribution of the Gas in Los Angeles.

At the West Glendale terminus of the transmission main, the gas is fed through two 16 in. mains to the plants of two central, local distributing companies. From the plants of these companies the following mains have been constructed:



Piping Layout of Glendale Terminal.

A 12 in. main 19.6 miles in length, for distribution of straight natural gas in the beach town Redondo, and an 8 in. main 4.324 miles in length, branching therefrom to serve the industrial town of Torrance.

An 8 in. main, 17.926 miles in length, for distribution in the beach town Long Beach and also the towns of Vernon, Huntington Park and Compton. From this main gas is also distributed to the harbor cities San Pedro and Wilmington. In all of these towns, however, the natural gas is mixed with artificial gas in equal parts before being distributed.

A main, partly 8 inches and partly 6 inches in diameter, 14.75 miles long, for distribution in Sawtelle, and the beach towns, Santa Monica, Ocean Park and Venice, where at present the gas is again mixed with artificial gas.

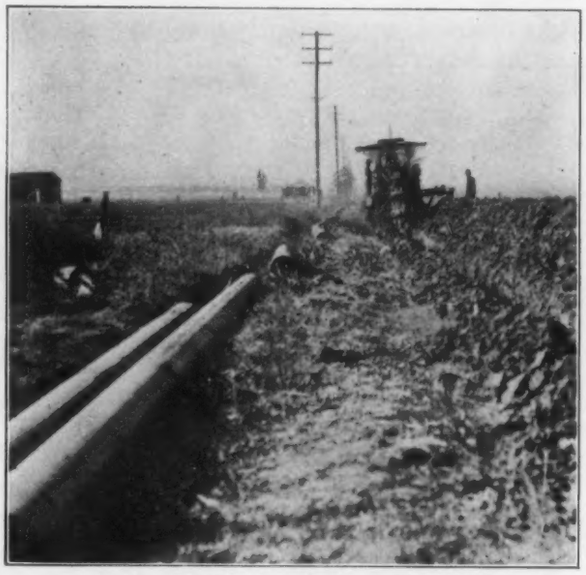
Besides these mains a line is tapped off the main Midway line at a point a few miles before it reaches West Glendale in order to supply the towns of Fernando and Burbank with natural gas.

One of the distributing companies consumes on the average of 3 million cu. ft. per day at present, for use under their boilers in their large gas producing plant at Tenth and Santa Fe streets and for mixing it with artificial gas in equal parts for distribution to their 29,000 consumers in the city of Los Angeles and vicinity.

From the other artificial gas plant about 80 per cent of the people of Los Angeles and Pasadena are supplied with mixed gas, of which one-half comes from the Midway field. In summer from eight to nine million cu. ft. of the natural gas is used and in winter about twelve million. All the gas is measured before it enters the company's six holders with an aggregate capacity of fourteen and a half million cu. ft. the largest having a capacity of six million cu. ft. Of the above amount from three to four million cu. ft. are used as fuel in the company's gas plant. The company owns about 1100 miles of pipe within the territory in which it operates and supplies mixed gas to about 129,000 consumers at 68 cents per 1000 cu. ft.

Supply from the Whittier & Fullerton Field.

So as to be prepared for the realization of an "Always ready to serve" slogan the Midway and Southern California Gas Companies decided some time ago to supplement their Midway supply by gas from the Whittier-Fullerton field, about 25 miles from Los Angeles. These wells are owned by the Standard Oil Company, who now supply gas to the El Segundo refineries. The compressor plant at the foot of the hills used for this purpose is now being enlarged in order to be able to meet the probable demand of the above companies for a maximum of 10,000,000 cu. ft. per day during the coming winter. From this plant a line is being laid to a measuring station about 4 miles distant and from here to a point 10 miles away a line has been constructed to join the Midway line and at this junction a regulator station will be built. The total distance from the compressor station to Los Angeles is 20 miles. It is laid in 36 ft. sections and has an inside diameter of 8 inches. It is plain end steel pipe and where it passes under water, the screw ends are joined by river and collar leak clamps. The sections of the pipe are being welded together by the oxy hydrogen method and by thus securing a continuous length of pipe, nearly 20 miles in length an uninterrupted service, as far as any pipe trouble is concerned, is guaranteed. It is expected that this line and the stations will be ready for operation within the next two months.



Ditching Machine for Midway 12 in. Line.

Natural Gas for Homes and Factories.

This treatise would be incomplete without a brief reference to the commercial aspect of the subject, so far as it relates to the use of natural gas for domestic and industrial purposes. Its introduction into Los Angeles at this period of its industrial revival will go far toward inducing manufacturers to locate their factories in or near that city, for cheap fuel is one of the primary factors in the determination of a factory site. This argument is equally applicable to the use of natural gas by other establishments such as bakeries, hotels, restaurants, and shops where a source of heat is required for manufacturing purposes.

The introduction of natural gas into the home, necessitates a simple adjustment of the old artificial gas appliances to meet the new conditions. These adjustments can readily be made without inconvenience to the consumer.

Owing to the rapid development of the natural gas interests throughout the United States and Canada the manufacturers of gas-consuming appliances have adopted mixers having adjustable gas orifice nozzles in place of the solid nozzle, with a fixed orifice, as formerly used in artificial gas practice. A range or other appliance, of such construction, is very easily adjusted to meet the new conditions due to a change in the quality of the gas or the pressure at which the gas is delivered.

Within the past few years an efficient and popular natural gas heater has been devised and introduced, in which the Bunsen principle is not employed.

Natural gas is found to produce satisfactory results, and besides having greater efficiency than any other fuel, has the advantages of cleanliness and safety. It eliminates dirt, ashes and soot. To a mild climate it is especially well adapted. And all of these advantages of natural gas are already appreciated by over ten million users throughout the United States.

GOVERNMENT CONTROL OF WATER POWER

BY HERBERT E. LINDEN.

The first question to be answered in discussing the advisability of government control of our water power resources is: who is the government?

The government in a republic is the people. In this country it consists of the people of a state and the people of the states.

Having this clear in our minds we know for whose benefit the natural resources of the country should be developed, and will consider this as the major subject.

The people of each state should reap the benefits of every resource within the state's boundaries just as much as any man will within his own fences.

The water is as much a part of the state as are the mountains from which we are taking the coal and metals for the good of the people instead of letting this wealth go to waste through non-use. Why should we not for the same reason make use of the water? We should.

However, a majority of the streams are bordered by lands owned by the government of the states, federal government, which lands are necessary to occupy when converting the power of the stream into electrical energy. Naturally this government feels these lands are valuable because of the proximity to the streams, whereas if it were not for the streams they would in most cases be valueless. In other words, this natural resource, water, puts the value on the land. Hence, that is as much the governing factor in this case as when a man puts a price on a piece of desert land he has reclaimed with water.

Using the above as a basis the writer suggests the following policy with reference to the development of water power on public lands.

A permit should be granted by the state for the use of the waters, and at that time the federal government should give title to the lands necessary for the construction of the project, and without any reservations whatsoever, as the permit granted by the state should take care of everything, such as time limit as to when the lands should be occupied and the water put to use, etc. This permit should be for an indefinite period and should only become void in case of non-use of the waters applied for.

As a consideration for title to such lands and use of water a tax should be paid to the state, two-thirds of it to be retained and the remaining one-third to be paid the federal government. This tax should be based on kilowatte capacity installed in the power house. By basing it in this way it would have a tendency to discourage any undue overdevelopment, as no one would like to be paying a tax on something which is not going to bring in a revenue to take care of such expenditure.

If this tax was $2 per horsepower per year, the income to the state and federal governments from the total available water power when fully developed would be about $40,000,000 yearly, as over 50 per cent of the total available water power in the Western states is on public lands. The above named figure of tax per year would mean with a 50 per cent load factor 0.07c per kilowatt-hour or about 25 cents per kilowatt per month. This tax should apply to cities and municipalities as well as private corporations.

No doubt such an interest on a capital investment donated to the people by the Almighty should prove far more beneficial than the expenditure of vast sums of money, which the people would have to supply through a personal tax, for the construction or purchasing of developments to be operated by the government. Furthermore it is a fact that private capital is far more ready to develop a project and in such a way let the people receive the benefits of the power generated, earlier than by government ownership. It is also safer for the people in the matter of price to be paid for the power to have a corporation, controlled by a state commission, supply this power, as the management of the hydroelectric system will not in that case be dependent on a political control which has the tendency of decreasing instead of increasing efficiency which it takes years to develop, and which is absolutely essential in the matter of low cost of power.

In considering the people in this matter it is vital not to forget those who invest in hydroelectric enterprises. Why should a man build a power plant on some one else's ground any more than he would do so with his own home? We are always very careful in searching the title of any lot we intend to buy, and would not think of putting a cent's worth of improvements on said lot unless we were sure of the title of the same. Why not be just as particular in the matter of power plants?

Also why not be just as anxious to protect the people who invest as the people who buy? Both are dependent on each other for success.

Hydraulic equivalents are convenient for many calculations if expressed approximately. The following are nearly enough correct for most purposes.

1 cu. ft. = 7½ gallons and weighs 62½ lb.
1 cu. ft. per sec. = 450 gallons per minute.
1 cu. ft. per sec. flowing one hour = 1 acre-inch.
1 cu. ft. per sec. flow 12 hours = 1 acre-foot.
1 acre-foot = 43,560 cu. ft. = 325,851 gallons.
1,000,000 cu. ft. = 22.95 acre-feet.

A co-operative water power agreement regarding permits for development withdrawn by the United States for water power purposes has been executed between Franklin K. Lane, Secretary of the Interior, and John H. Lewis, State Engineer for Oregon. Similar agreements are pending in other Western states. This will eliminate previous duplication of surveys and the unnecessary payment of fees as it will enable an applicant to determine the attitude of both state and federal governments. Neither government will approve an application until notification has been received from the other party as to their intent to approve or disapprove it, a 60-day limit being fixed. "The Secretary of the Interior will furnish the state engineer with copies of all reports of construction work and operation reports on power cases in the state of Oregon, with sets of blue prints of maps and plans of such power projects after completion of construction, except such as may have been filed as confidential information, and with proclamation diagrams of all power site withdrawals in effect at the time of the execution of this contract and shall notify the state engineer of any changes and additions thereto."

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Public Questions

Seldom have the complex and elusive questions about the future of public utilities in America been more clearly propounded than as specifically asked by Mr. Paul Shoup, regarding the electric railways of California, elsewhere in these columns. What applies to electric railways in particular concerns public utilities in general. It is only by such a microscopic analysis that a macroscopic synthesis is possible. Nor are these conditions peculiar to one state. They are found wherever people are enjoying the results of the constructive optimism of investors.

Mr. Shoup proves that the electric railways of California are not earning interest and fixed charges upon money actually invested in the properties. They are subjected to an unfair and unregulated competition which, by the irony of fate, depends largely upon the very pavement that the electric railways are compelled to maintain and do not themselves use. They, in common with all other public utilities, carry a heavier burden of state taxation than do other classes of legitimate business. These are not pessimistic phantasies, but the hard facts which now face the men whose hope and grit built these roads.

In the first place, it is shown that the electric railways of California are not self-sustaining, for the mere earning of operating expenses does not constitute self-sustenance.

In the second place, it is shown that unfair competition and undue taxes are largely responsible for this failure to be self-sustaining.

These facts and causes are put by Mr. Shoup as public questions,—to be answered by the public.

To the private individual the answer is obvious. But in his public character he appears oblivious to the disaster threatened by his neglect to take the steps necessary to avert it. So the first task that now devolves upon the electric railway men is to teach the obvious to the oblivious public by showing how the public's best interests are being injured by inaction.

Teaching the Obvious to the Oblivious

Public utilities are overlooking the value of publicity in establishing better relations with the public. Publicity in this sense, is broader than advertising. Advertising is selling. Publicity builds good will. Most public utilities are monopolies and supply a service which is more or less of a public necessity. Consequently they obtain a large part of their business without having to advertise. An electric light, or a telephone, is its own advertisement, as is likewise a street car ride from the home to the office.

But such monopoly business represents the minimum patronage of the public. Maximum business comes only after good will has been created. Good will means larger business, greater profit and less trouble. It represents an appreciation of the value of the service. It can be created by publicity.

Successful publicity requires the ability to think in groups, rather than units, and involves the faculty

of analyzing the group spirit to which the appeal is being made. It anticipates and guides the tendency of public thought. The crowd principle is the first principle of publicity, obtaining crowd confidence the first problem.

Confidence is that quality which causes others to accept your statement without question. Public confidence depends not so much what is done as what is said about what is done. The world knows you by what you tell it. The only way to get public confidence is to take the public into your confidence. This does not consist in complimentary notices about the utility or its officials, but in facts of public interest.

When there is an accident, give full publicity to the causes and to the steps that have been taken to prevent its repetition. Teach the public about the complex mechanism wherewith they are served. Let them understand the tremendous investment involved, the technical skill employed, and the operating difficulties entailed by storms or other natural causes beyond man's control. Publish details as to revenues and expenditures so that the public can realize that no undue profit is being made.

Finally, truthful publicity makes true friends just as truly as secrecy makes enemies. In order that the public be willing to help the utility it must understand the utility's problems. Full explanation should be made regarding all corporate activities and policies.

Such publicity is of an educational nature. It is in no way a substitute for advertising. It should be augmented by selling talks so as to increase the use of the utility. Electricity is as convenient an agent for power or for heating as it is for lighting; more motor and heating appliances in use mean lower lighting costs. The electric railway is as valuable in pleasuse as in business, advertising parks and other attractions increases travel. The telephone is an instrument of constantly increasing service whereof the public should be told.

But surpassing all advantages yet told is the opportunity offered by publicity for teaching the obvious to the oblivious. More money has been invested in the electric power, illumination, transportation and communication serving companies of America than is represented by the money cost of the European war to date. The entire gold production of the world since 1849 would not be sufficient to pay the ten billion dollars and more represented by the privately owned electric utilities of this country. Publicity is the one means of present preparedness whereby this tremendous investment can be protected against the insidious foes which are assailing it. Abandon the past policy of secrecy before it is too late!

What is a Self-Sustaining Utility

Few will controvert the statement that "the mere earning of operating expenses does not constitute self-sustenance," but many will question what additional elements are necessary to make a public utility self-sustaining.

A number of financiers and commissions seem to think that a utility is taking care of itself when it pays its costs of operation and the charges for depreciation and interest. They apparently consider that all money invested is a permanent investment, captured capital, as it were. They make no provision for retiring the invested capital within a reasonable time, notwithstanding that the equipment which represents it may have become obsolete.

In order that there be stable equilibrium at least three supports are necessary. Likewise, in order that there be stable investment, three essentials should be cared for, operating expenses, interest charges and amortization of capital. Many an investor, furthermore, will not surrender the use of his money, even for temporary capture, without assurance of at least as great a profit as can be made in any ordinary business. So that there may be stable and attractive investment, there might also be a fourth support, a legitimate profit in the form of dividends.

In the public utility business, however, the public quality of the service rendered takes precedence over the private character of the business done and with the assurance that it has the stability imparted by the tripod, conservative investors may be willing to forego the possible profit so as to insure the probable safety of their investment.

Oil Samples for Boiler Tests

The U. S. Bureau of Mines, in Technical Paper No. 3, has set forth a series of well formulated directions for the sampling of oil when deliveries are made for purchase by the government. These instructions are helpful in preparing specifications for sampling of oil in purchases made for central stations.

Little published information is to be found, however, setting forth explicit directions for boiler tests wherein oil is used as a fuel. A few suggestions are consequently in order.

It is assumed that the oil-weighing apparatus has been properly installed. Ordinarily it consists of a main supply tank for feeding the oil to the furnace and an auxiliary tank mounted above standardized scales. The operator selects a dipper of oil from each tankfull weighed on the platform scales. Each sample is weighed and thoroughly mixed with the others. This mixture is divided into three parts, each being sealed. One part is to be analyzed by the party for whom the test is being made, the second is to be analyzed by a disinterested party and the third is to be retained for analysis in case of disagreement.

Every testing requirement is thus met. Oil, unlike coal and other fuels, does not disintegrate with time, so that the sealing of the third sample offers an exceptional opportunity for checking up results in case of any question, an impossibility with other types of fuel.

When oil is used as fuel the starting and stopping conditions set forth in the A. S. M. E. Boiler Testing Rules can be modified so that the weighed oil can be introduced into the oil feed lines from the reserve tank after the boiler and furnace have been heated to the normal operating temperature. By noting the steam pressure and the height of water at the time of starting and of stopping the test, and by measuring the amount of oil consumed during the test, all the data required are available for computation.

PERSONALS

E. H. Schmitz, an electrical dealer of Woodland, Cal., is at San Francisco.

F. J. Airey of the Pacific States Electric Company, Los Angeles, Cal., is at San Francisco.

A. Terkell, an electrical contractor of Reedley, Cal., was a recent visitor at San Francisco.

S. Tyson of the Exeter Electrical Works, Exeter, Cal., was a recent visitor at San Francisco.

H. Fish of the Los Angeles house of the Western Electric Company, was at San Francisco this week.

H. C. Thurston, an electrical contractor of Ukiah, spent a few days at San Francisco during the week.

E. A. West, efficiency engineer with the Portland Railway, Light & Power Company, is at San Francisco.

John H. Carr, manager of the Valley Electric Company, Fresno, Cal., was a recent visitor at San Francisco.

W. Hanisch of the Roseville Telephone Company, Roseville, Cal., spent a few days at San Francisco during the week.

J. O. Jensen of the Los Gatos Telephone Company, Los Gatos, Cal., spent a few days during the week at San Francisco.

W. S. Greenfield, manager of H. W. Johns-Manville Company, San Francisco, spent the first part of the week at Sacramento.

P. E. Longstreet, electrical manufacturers' representative at Los Angeles, spent a few days during the week at San Francisco.

W. S. Lattimer, representative of the Western Electric Company, Hanford, Cal., was a visitor at San Francisco during the week.

C. Schemmel, manager of the Gilroy Telephone Company, Gilroy, Cal., spent a few days at San Francisco during the week.

J. Martin, superintendent of the Drum District Pacific Gas & Electric Company, Drum, Cal., was at San Francisco during the week.

B. B. Beckett, electrical engineer for the Goldfield Consolidated Mining Company, Goldfield, Nevada, was a recent visitor at San Francisco.

A. V. Olson, associated with the Electric Railway & Manufacturers' Supply Company, San Francisco, has severed his connection with that company.

Geo. P. McFarlin, general manager for the Churchill County Telephone Company, Fallon, Nevada, was a visitor at San Francisco during the week.

W. C. Wurfel, Pacific Coast manager of the Westinghouse Lamp Company, has returned to San Francisco from an extended trip to Portland and Seattle.

D. C. Findley, electrical civil engineer, of Victoria, B. C., is in charge of all the electrical equipment to be installed at the new cement plant being installed at Oswego, Oregon.

A. J. Jarmin, secretary and treasurer of the Baker-Joselyn Manufacturing Company, Chicago, who has been on the Coast for the past several weeks, returned home the latter part of the week.

C. H. Kettron, president of the Illinois Electric Porcelain Company, Macomb, Illinois, spent the past week at San Francisco, enroute to Portland and the Pacific Northwest territory.

George R. Thompson, formerly motor salesman for the Century Electric Company, and more recently with the Baruch Electric Controller Corporation, has been appointed city salesman for the Baker-Joselyn Cobpany at San Francisco.

R. F. Behan, of the Westinghouse Electric & Manufacturing Company, San Francisco, and **S. H. Taylor,** president of the Electric, Railway & Manufacturers Supply Company, San Francisco, leave the last of the week to attend the Westinghouse Agent Jobbers' meeting at Pittsburgh, after which they will visit the various commercial centers of the East.

S. Z. Mitchell, president of the Electric Bond & Share Company, has returned to New York after completing the details of the merger of a number of Idaho electric properties which have been taken over by the National Securities Corporation. These include the Oxbow plant on Snake River, the Swan Falls plant, the Malad plant and the Boise-Payette plant, which will be interconnected with the plants of the Utah Power & Light Company. The state has granted the Shoshone plant a permit to combine in the power service and the Thousand Springs plant is allied with the Shoshone plant by contract.

MEETING NOTICES.

Jovian Electrical League of Southern California.

A few hundred Jovians assembled at the October 27th luncheon to hear Congressman Pieper's account of the National Jovian Congress, to enjoy the musical entertainment provided and to hear D. M. Delmas speak on "The Gods," F. J. Airey acting as chairman of the day. H. T. Matthew also spoke regarding the importance of Electrical Prosperity Week.

Los Angeles A. I. E. E. Section.

An interesting and well-attended meeting of the Los Angeles Section of the A. I. E. E. was held at the Chamber of Commerce on October 21, Chairman E. Woodbury presiding. The subject for discussion was "Synchronizing Commercial and Operating Departments in Public Utility Organizations." G. B. McLean, of the Pacific L. & P. Corporation, spoke highly of the weekly meetings of the twenty-seven department heads and the weekly meetings of the company's salesmen. H. J. Kister, of the L. A. Gas & Electric Corp., spoke of the value of suggestion boxes, which have saved the company much time and money. A splendid paper, entitled "Loyalty of Corporation Employees," was then read by R. H. Ballard, of the Southern California Edison Company, who styled his address "Non-partisan, non-religious and non-technical." Dean Damon, of Throop College, addressed the members on the value of loyalty and initiative.

Electrical Development and Jovian League.

The October 27 meeting of the league proved to be the largest meeting held thus far this year, one hundred and nineteen members being present. Vice-President E. M. Cutting presided. After the introduction of visitors, the report of the membership committee of the league, consisting of thirteen new members, was presented and adopted. The chairman of the day was S. A. Hamilton, of the Gas & Electric Appliance Company, and, by coincidence, the meeting date fell on his thirty-fifth anniversary. This feature was dwelt upon throughout the entertainment part of the meeting, the tables being decorated with toy balloons, and the chairman being presented with a beautiful birthday cake surmounted by thirty-five burning candles. Mr. Jerome Landfield was presented as speaker of the day, treating of the political situations existing for years in the Balkan States and their influence upon the present European conflict, upon conclusion of which the speaker was given a hearty vote of thanks, and the chairman congratulated upon his very successful meeting.

Portland A. I. E. E. and N. E. L. A.

The combined luncheons of the Portland Electric Club and the local sections of the A. I. E. E. and the N. E. L. A. was held under the new officers' management on the fifth floor of the Commercial Club, Thursday, October 28th. J. E. Davidson, vice-president and general manager Pacific Power & Light Company, acted as chairman. E. G. Crawford, vice-president of the Lumbermen's National Bank, Portland, Oregon, was the speaker of the day. His subject being "Credit and Its Abuses." Mr. Davidson has been appointed chairman of the committee to arrange for "Electric Night" at the Manufactures and Land Products Show, now being held at the armory.

Mr. Will Spaulding is chairman of the committee to arrange for the electrical vehicle parade to be held in connection with "Electric Night."

It was announced that the committee arranging for Electrical Prosperity Week are working in connection with the Retail Merchants' Bureau of the Portland Chamber of Commerce.

Mr. Crawford said in part: Modern banks deal in credits —actual cash and currency is only used for about 5 per cent of the total business transacted. The assets of banks are made up of two classes. (1) Gold, silver, currency and government bonds. (2) Notes. Credit must be handled wisely and not abused, or the community suffers. When a bank allows anyone more credit than should be given, it is instrumental in causing the community to become demoralized, and they suffer in proportion to the extent credit is abused. The attendance was 65. Next luncheon will be on November 11th, at the Commercial Club.

The next regular technical meeting of the local sections of the A. I. E. E. and the N. E. L. A. will be held in the new assembly hall at the Electric Building, Portland, Oregon, at 8 p. m., November 9th. A moving picture show is on the program and a technical paper will be announced later.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

The Pacific Gas & Electric Company has filed with the commission, an application for authority to sell certain shares of its stocks and bonds, and to spend the proceeds in paying for construction expenditures, and to reimburse its treasury $1,447,500 issued in payment of gold notes, dated December 15, 1914. On July 1, 1914, the commission authorized the company to sell $5,000,000 face value, general and refunding mortgage gold notes, and $12,500,000 par value of first preferred stock, for certain purposes.

NEWS OF ARIZONA CORPORATION COMMISSION.

The commission has authorized the Buckeye Irrigation Company to issue $35,000 in ten year bonds bearing 6 per cent interest, to be applied to redeeming $19,000 outstanding bonds and in new construction, additions and improvements to the irrigation system.

LATE APPLICATIONS TO THE STATE WATER COMMISSION OF CALIFORNIA FOR PERMITS TO APPROPRIATE WATER.

C. S. Compton, D. L. Whisman and C. M. Burkett, Paradise; agricultural; 75 second feet on Little Buttee Creek; diversion, Sec. 18, T. 23 N., R. 4 E, M.D.M.; 75 second feet on west branch of Feather River; Sec. 1, T. 22 N., R. 3 E., M.D.M.

Harold M. Hall, Los Angeles; irrigation and domestic; 3¾ second feet from Rock Creek and Fall (or Silver Creek), Mono county; diversion; Secs. 30 and 31, T. 2 S., R. 33 E., M.D.M.

Henry J. Lawrence and Edward A. Lawrence, Palo Verde, Imperial county, Cal.; irrigation; 16 second feet from Palo Verde Lagoon in Imperial, Cal.

H. J. Barton, Oak Bar, Cal.; mining; 100 second feet from Beaver Creek, Siskiyou, county.

B. Burton, B. F. Caldwell and Carroll Evans, as the Afton Land, Water & Power Company; Pomona, Cal.; agricultural; 150 second feet from surface and underground flow of Mojave River in San Bernardino county; diversion, in Sec. 20, T 11 N., R. 6 E., M.D.M.

Eugene Rutherford, care King & King, attorneys, Gridley, Cal.; irrigation; 25 second feet from Shaeffer Slough or Hamilton Slough, Butte county; diversion, in Sec. 16, T. 17 N. R. 1 E., M.D.M.

George M. Kelley, Alturas Cal., irrigation; 1060 acre feet per year from Canyon Creek and Portage Flat, tributary to Pit River; diversion, in Sec. 29, T. 41 N., R. 11 E., M.D.M.

J. P. Taggart, 1108 Hibernian building, Los Angeles, care Jas. S. Bennett, attorney, same address; agricultural and and domestic; 8000 acre feet per year from Banner and Chariot Canyons; diversion, Sec. 2, T. 13 S., R. 4 E. S.B.M., in San Diego county.

Albert Given, 1525 K street, Sacramento, Cal.; agricultural; 20 second feet from the American River in Sacramento county; diversion in Fair Oaks Addition.

Thomas Quigley, care Taylor & Tebbs, attorneys, Yreka, Cal.; power; 11 second feet from Beaver Creek, Siskiyou county; diversion, Sec. 6, T. 46 N., R. 8 W., M.D.W.

City of Los Angeles; power; 40 second feet from Levining Creek, Mono county; diversion, Sec. 21, T. 1 N., R. 25 E., M.D.M.; 45 second feet from Rush Creek Mono county; diversion in Sec. 20, T 2 S., R. 26 E., M.D.M.

Andrew Swickard, Palo Alto, Cal.; irrigation; 160 second feet from Coyote Creek, Santa Clara county.

City of Los Angeles; power; 65 second ft. from Big Pine Creek, Inyo county; diversion, in Sec. 36, T. 9 S., R. 32 E., M.D.M.; 20 second feet on Cottonwood Creek, Inyo county; diversion, in Sec. 11, T. 17 S., R. 35 E., M.D.M.

Jefferson J. Rhinebold, Etna Mills, Cal.; mining purposes; 25 second feet from Taylor Creek, East Fork, Siskiyou county.

TRADE NOTES.

Vanderlip & Lord reconstructed the electric system for the entrance which has been erected for the Star Theater.

J. B. Sturges has the contract for the electrical installation in the Beck Inn Company's building at 71½ Broadway.

Stone & Webster Con. Co., 415 Rialto building, have moved their offices to 1211 First National Bank building.

The NePage, McKenny Company is installing the electrical work in the new M. E. Church school at 445 Taylor street.

M. J. Walsh & Company received the electrical contract for the equipment of the Manufactures and Lands Products show at Portland.

Miller & Halls have obtained the electrical wiring contract for Warehouse "B" and the addition to the Municipal Boat Landing; price $2440.

Smith-McCoy Electric Company is installing the electric equipment in the new building being erected at 63 North Fifth street. Half of this building will be occupied by The Pacific States Electric Company at Portland.

Tuesday, November 2, San Francisco Day at the Exposition, was generally observed throughout the electrical industry of the city, the jobbers, contractors, dealers, manufacturers, and even to the central stations, closing up in observance of the day.

The West Coast Electric Engineering Company has just completed the first half of the electrically driven cooperage mill of the Northern Cooperage Company at St. Johns, Oregon. All the work, including the lighting system, is installed in rigid iron conduit.

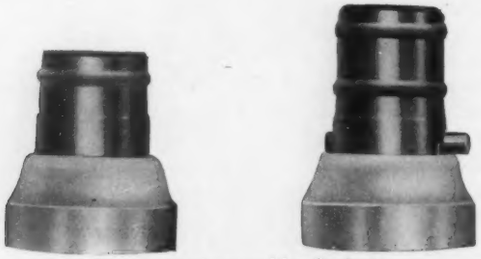
The West Coast Electric Company is installing the electrical work in the new school building being erected for the Monmouth Normal School, at Monmouth, Oregon. They are also doing the work in the new First National Bank Building being erected at Fifth and Stark streets, Portland, Oregon, and the new Lewis Building, at Thirteenth and West streets.

Electric, Railway & Manufacturers Supply Company have moved from their old quarters and now occupy the entire building at 36-38-40 Second street. The ground floor has been fitted up as an up-to-date retail store for the accommodation of the trade, while the second floor is occupied by the executive offices and the remaining ones given over to stock supply carried at San Francisco.

INDUSTRIAL

BRASS SHELLS OF NEW C-H WALL SOCKETS INTERCHANGEABLE WITH C-H FIXTURE AND PENDENT SOCKETS.

To fill out the C-H line of 660-watt push button brass shell sockets the Cutler-Hammer Manufacturing Company, of Milwaukee, has added three new catalogue Nos., 7550, 7551, 7561. These are all wall type sockets, the brass shells of which are the same as used on C-H fixture and pendent



New Interchangeable Sockets.

sockets. No. 7550 is the push button type while Nos. 7551 and 7561 are plain sockets without operating mechanism, the latter being a short socket. Round porcelain bases for concealed work are provided on all, the supporting screw holes in the bases being spaced 1 in. on centers. These sockets are National Electrical Code Standard with the approved rating of 660 watts, 250 volts. This high rating is particularly desirable today as sockets are used to a large extent for connection to many appliances besides lamps.

A REPEAT ORDER FOR ELECTRIC RANGES.

Repeat orders are generally regarded as the highest testimonial for a product. Just one year ago the Utah Power & Light Company of Salt Lake City made a contract with Brigham Whitmore to install twenty-six electric ranges in a new apartment house he was building. This was the first apartment in the city to use electric ranges and Mr. Whitmore entered into the contract with some misgivings. His doubts centered about two points: First, he feared the cost of current would be more than the class of tenants to whom he was catering would care to pay, and second, he thought that if the apartments were equipped with electric ranges some prospective tenants might be deterred from renting because they did not understand their operation. The electric company, however, had secured his confidence and he was willing to try the experiment.

The installation was completed just before the close of last year. The average bill during the past nine months has not varied more than a few cents from two dollars, whereas, the average bill in another apartment owned by Mr. Whitmore which is equipped with gas ranges, ranges around $2.50 per month—the class of tenants being substantially the same. Furthermore, the fact that the apartments were equipped with electric ranges has proven to be an advantage in renting them, some of his tenants even having gone so far as to tell representatives of the electric company that they would not move unless they could find another suitable apartment equipped with an electric range.

Mr. Whitmore has decided to remodel and modernize the building now equipped with gas ranges and has recently entered into a contract to purchase eighty Hughes electric ranges from the Utah Power & Light Company for this purpose. This magnificent repeat order is in itself the strongest possible testimonial that electric ranges have made good.

THE LARGEST CENTRAL STATION BATTERY.

The Detroit Edison Company of Detroit, Mich., has contracted for the building and erection of a new central station storage battery, which will make it the largest in electrical output ever built for emergency use. The battery will consist of 150 cells, each containing 169 plates of Type H "Exide." Each of the 150 lead lined tanks will measure 6 ft. 7 5/8 in. in length, 21¾ in. in width and 4 ft. 2 in. in heighth. Each cell complete with plates and electrotype will weigh 7700 lb.

The capacity of the complete battery will be 12,600 amperes for one hour, or 26,040 at the 20 minute emergency rating. In connection with the operation of this large battery the Electric Storage Battery Company will build four 7 point 10,000 ampere motor driven end cell switches, two of these to be placed on each side of the three wire system. This plant will be erected in the Congress Street Substation of the Detroit Edison Company and is expected to be completed for service about December 15th of this year.

TRADE NOTES.

The plant of the U. S. Electrical Manufacturing Company at Los Angeles was burned on October 28th, most of the damage being covered by insurance. Temporary quarters were immediately established so that by November 1 the output was about up to normal.

The Electric Truck Service Company has been organized in Salt Lake City, with A. O. Whitmore as its president to furnish electric batteries and electric battery service for electric trucks in operation in the city. Mr. Whitmore has maintained an agency and garage for electric pleasure vehicles for the past several years. George B. Turner, for several years past identified with the automobile industry, is manager of the new concern. The company has leased and remodeled for use as a garage the large building on Second East street between South Temple and First South, formerly used by the Utah Light & Railway Company as a car-barn. While several central stations have inaugurated battery service for trucks it is believed that the Electric Truck Service Company is the first one independent of a central station to adopt this progressive sales policy and its success will be followed with much interest. The Utah Power & Light Company has purchased two additional trucks to operate under this system.

"Great," said Thomas A. Edison, as he and Henry Ford viewed the exhibit of the Diesel engine in the center of the Palace of Machinery at the Panama-Pacific Exposition. Both Mr. Ford and Mr. Edison examined this engine with the utmost interest, expressing their admiration for the excellent workmanship and operation of this latest and most marvelous prime mover. Mr. Edison was especially interested in the engine and its adaptation to submarines, and stated that the engine and the space allowed for it in the boat must be given more consideration in the construction of submarines to have them an absolutely reliable means of defense. Mr. Ford spoke of the power plant in his factory at Detroit being a combination of a producer gas engine and a steam engine, the exhaust gases from the gas engine being used to jacket the steam engine cylinder and the exhaust from the steam engine being used to assist in scavenging the gas engine cylinder. Due to Mr. Ford's intimate knowledge of the gasoline engine he could hardly believe it possible that an engine of such a size, as the 500 h.p. Busch-Sulzer Bros.-Diesel Engine operating in the Palace of Machinery, used no spark whatever for the burning of the oil and that the fuel used in the engine was of such a cheap character.

NEWS NOTES

INCORPORATION.

DUNCAN, ARIZ.—The Magdalena Ice, Light, Power, Water & Laundry Company has been incorporated with capitalization of $75,000.

ILLUMINATION.

BOISE, IDAHO.—Bids are being received by the Capitol building trustees for furnishing electric light globes for the capitol buildings.

FREDERICK, COLO.—The city council has under consideration the installation of a special street lighting system. Address the town clerk for information.

TERRY, MONT.—L. H. Gaffney of this place has been granted a franchise by the town council for the installation and operation of an electric light plant.

TWIN FALLS, IDAHO.—The city council has granted a franchise to James McMillan granting him permission to construct and operate a gas plant in this city.

HOLBROOK, ARIZ.—H. D. Steele, electrician, has taken the contract for placing poles and stringing wires in Holbrook for the Holbrook Light & Power Company.

OAKLAND, CAL.—The city engineer has been directed to prepare plans for the installation of electroliers on Grove street, between Forty-seventh street and the Berkeley line.

FORT COLLINS, COLO.—The city council is considering the installation of a special street lighting system, information in regard to which may be obtained from the city clerk.

YUMA, ARIZ.—J. G. Wensley of Wharton, Tex., an electric plant owner, is in this city investigating conditions with reference to putting in an electric plant in this section of the country.

PHOENIX, ARIZ.—City Architect Byron has completed working drawings for new lighting standards. The contract for furnishing 300 of the fixtures has been let to the Williscroft foundry.

PRESCOTT, ARIZ.—The Big Development Company has signed a contract with the Arizona Power Company for 300 horsepower to operate machinery to be installed at once on the Henrietta and Butternut properties.

SEATTLE, WASH.—Six bidders submitted bids to the board of public works for a year's supply of incandescent lamps for the city lighting department, amounting to about lighting, J. D. Ross, for recommendation.

BAKERSFIELD, CAL.—The Kern Trading & Oil Company will lay a 6 5/8 in. pipe line from its Maricopa camp at Kerto to McKittrick field for the purpose of transporting natural gas. The line will be 18 miles long.

PILOT ROCK, ORE.—L. K. Harlan and J. B. Sparks have a plan for moving an electric light plant to Pilot Rock. The plant to be moved from Lexington. The council has ordered an ordinance drawn granting a franchise to Mr. Harlan.

MANHATTAN, CAL.—The board of trustees is receiving bids for furnishing, installation and maintenance of posts, wires, etc., and electricity for lighting of Fifth street for a period of two years beginning November 15, 1915, and ending November 15, 1917.

KEMMERER, WYO.—The town council is advertising for bids for the installation of a special street lighting system consisting of twelve posts each equipped with five 100 watt lamps. Specifications covering the same may be obtained from John Mason, city clerk.

GLASGOW, MONT.—The special election held here to vote on the issuance of $18,000 bonds for buying new equipment and enlarging the municipal electric light plant, resulted in favor of the proposition by a substantial majority. The work will be begun in the near future.

BOISE, IDAHO.—Announcement of the construction of a second 10,000 kilowatt unit of the Utah Power & Light Company plant at Oneida has been received by the local power men. The cost of the construction will be $250,000. S. Z. Mitchell, president of the Electric Bond & Share Company, stated that the construction would probably be authorized immediately.

LOS ANGELES, CAL.—At a meeting of the city trustees the city attorney was instructed to draw an ordinance calling an election for the purpose of allowing citizens of Huntington Beach to vote on the question of bonds for installing a municipal gas plant or taking over the present system. The city engineer made an estimate of duplicating the present system, the cost to be about $15,000.

TULARE, CAL.—The city council has instructed the city clerk to write to the State Railroad Commission requesting that the final hearing of the Mt. Whitney Power & Electric Company rate case be held in this county instead of San Francisco November 18, and to take the matter up with other cities in the county. The hearing was at first scheduled for Visalia, but was later changed to San Francisco.

AUBURN, CAL.—The Pacific Gas & Electric Company is making preparations to resume construction work on its system in the vicinity of Auburn and Clipper Gap. The first work will be done on the partly completed tunnels, which are to be about 10,000 feet in length, and of which 4000 feet is already constructed. For several days men have been employed in going over the equipment, which is scattered between Auburn and Lake Spaulding, and getting it ready for shipment to points where it will be used. It is not expected to have the work in full swing untin early in the spring, when over 200 men will be employed. Power house No. 4, near Clipper Gap, and No. 5, just below Auburn, will be completed at once, the material for these two plants being already on the ground.

TRANSMISSION.

BLACKFOOT, IDAHO.—The city council has employed Engineer James Young of this city to inspect several sites on the Blackfoot River which are under consideration for the location of a municipal electric light and power plant. He will also prepare plans and specifications for the proposed system. The chances look favorable that construction will be proceeded with in the near future.

MARSHFIELD, ORE.—The Oregon Power Company will extend its service to supply the United States wireless station passing through two, at present unserved, additions to the city. Aside from the government load a considerable amount of residence lighting business will be secured. The North Bend Mill & Lumber Company is making changes and additions to its mill and will install 145 horsepower in motors. The load will be served by the Oregon Power Company.

TELEPHONE AND TELEGRAPH.

KINGMAN, ARIZ.—The Arizona, California & Nevada Telephone Company is arranging to install telegraph service with direct connections with Los Angeles, San Francisco and other outside points.

CARRIZOZO, NEV.—The San Patricio telephone line from Hondo to Lincoln has been put in good shape and contract will be let soon for fixing up the San Patricio end of the line; 50 to 75 new poles will be put in and the line put in good condition.

TOMBSTONE, ARIZ.—Manager Harry Evans of the Mountain States Telephone & Telegraph Company expects soon to install a number of telephones.

ALPHABETICAL INDEX TO ADVERTISERS

The letter and number before each name are used in the classified page following

A-1 American Ever-Ready Works of National Carbon Co.... Los Angeles; 755 Folsom Street, San Francisco; Seattle.

Atchison, Topeka & Santa Fe Railway Co..... 673 Market St., San Francisco; 1218 Broadway, Oakland.

B-2 Benjamin Electric Manufacturing Co..... 590 Howard Street, San Francisco

B-5 Bridgeport Brass Co..... 4 (See Pierson, Roeding & Co.)

B 7 Busch-Sulzer Bros.-Diesel Engine Co..... 11 Rialto Bldg., San Francisco.

C-1 Century Electric Co..... 12 906 So. Hope Street, Los Angeles; 56 Natoma Street, San Francisco; 65 Front St., Portland, Ore.

C-3 Crocker-Wheeler Co..... Salt Lake City; Crossley Bldg., 618 Mission St., San Francisco; Seattle.

C-4 Cutler-Hammer Manufacturing Co..... 579 Howard Street, San Francisco; Morgan Bldg., Portland, Ore.; San Fernando Bldg., Los Angeles.

D-1 D. & W. Fuse Co..... 3 Western Electric Co.

D-4 Davis Slate & Manufacturing Co..... 3 Chicago, Ill.

D-2 Dearborn Drug and Chemical Works..... 11 355 East Second Street, Los Angeles; 301 Front Street, San Francisco.

D-3 Dover Manufacturing Co..... Canal Dover, Ohio.

E-1 Edison Lamp Works of General Electric Co..... Rialto Bldg., San Francisco; 724 So. Spring Street, Los Angeles.

E-2 Edison Storage Battery Supply Co..... 441 Golden Gate Avenue, San Francisco.

E-3 Electric Agencies Co..... 247 Minna Street, San Francisco; Central Building, Los Angeles.

E-4 Electric Storage Battery Co..... 11 Pacific Electric Bldg., Los Angeles; Spalding Bldg., Portland; 118 New Montgomery Street, San Francisco; Colman Bldg., Seattle.

E-5 Electric, Railway & Manufacturers Supply Co..... 84 Second Street, San Francisco.

F-1 Fairbanks, Morse & Co..... Los Angeles; Portland; 651 Mission Street, San Francisco; Seattle; Spokane.

F-3 Federal Sign System (Electric)..... 618 Mission Street, San Francisco.

G-1 General Electric Co..... 10 724 So. Spring Street, Los Angeles; Worcester Bldg., Portland; Rialto Bldg., San Francisco; Colman Bldg., Seattle; Paulsen Bldg., Spokane.

G-2 General Vehicle Co..... 1117 Van Ness Avenue, San Francisco; 331 Wall Street, Los Angeles; British Columbia Electric Ry., Ltd., Vancouver, B. C.

H-1 Habirshaw Wire Co..... (See Western Electric Company.)

H-2 Hemingray Glass Co..... 3 330 So. L. A. Street, Los Angeles; 345 Oak Street, Portland; 807 Mission Street, San Francisco.

H-5 Hunt, Mirk & Co..... 141 Second Street, San Francisco.

H-7 Hurley Machine Co..... New York and Chicago.

I-1 Indiana Rubber and Insulated Wire Co..... 2 Fobes Supply Co., Portland and Seattle.

K-1 Kellogg Switchboard and Supply Co..... Aronson Bldg., San Francisco.

K-2 M. W. Kellogg Co..... (See Pierson, Roeding & Co.)

L-1 Leahy Manufacturing Co..... Eighth and Alameda Street, Los Angeles.

L-2 Locke Insulator Manufacturing Co..... 4 (See Pierson, Roeding & Co.)

M-2 McGlauflin Manufacturing Co..... Sunnyvale, Cal.

M-4 Morse Chain Co..... 5 Monadnock Bldg., San Francisco.

M-3 Moore & Co., Charles C..... 3 Van Nuys Bldg., Los Angeles; Spalding Bldg., Portland; Kearns Bldg., Salt Lake City; Sheldon Bldg., San Francisco; Mutual Life Bldg., Seattle; Santa Rita Hotel Bldg., Tucson.

N-1 Nason & Co., R. N..... 151 Potrero Avenue, San Francisco.

N-2 National Conduit & Cable Co., The..... Trust and Savings Bldg., Los Angeels; Rialto Bldg., San Francisco.

N-3 National Lamp Works of G. E. Co..... (All Jobbers.)

N-4 New York Insulated Wire Co..... 4 629 Howard Street, San Francisco.

N-5 Northwestern Pacific Railroad..... 3 808 Phelan Bldg., San Francisco.

O-1 Okonite Co. (The) ..... 12 (All Jobbers.)

P-1 Pacific Electric Manufacturing Co..... 80 Tehama Street, San Francisco.

P-2 Pacific States Electric Co..... 2 236-240 So. L. A. Street, Los Angeles; 90 Seventh Street, Portland; 200-210 12th Street, Oakland; 575 Mission Street, San Francisco; 307 First Avenue, So., Seattle.

P-4 Pelton Water Wheel Co..... 11 2219 Harrison Street, San Francisco.

P-5 Pierson, Roeding & Co..... 4 Pacific Electric Bldg., Los Angeles; Rialto Bldg., San Francisco; Colman Bldg., Seattle.

P-7 Pittsburgh Piping & Equipment Co..... 12 Monadnock Bldg., San Francisco.

S-1 Schaw-Batcher Company, Pipe Works, The..... 3 211 J Street, Sacramento; 356 Market Street, San Francisco.

S-3 Simplex Electric Heating Co..... 12 612 Howard Street, San Francisco.

S-4 Southern Pacific Co..... 2 Flood Bldg., San Francisco.

S-5 Sprague Electric Works..... 12 Rialto Bldg, San Francisco; Colman Bldg.; Seattle; 124 West 4th Street, Los Angeles; Electric Bldg., Portland; Paulsen Bldg., Spokane.

S-6 Standard Underground Cable Co..... 3 First National Bank Bldg., San Francisco; Hibernian Bldg., Los Angeles; Yeon Bldg., Portland; Central Bldg., Seattle, Wash.

T-1 Thomas & Co., R..... (See Western Electric Co.)

W-2 Western Electric Co..... Eighth and Santee Streets, Los Angeles; 1901 Telegraph Avenue, Oakland, Cal.; 680 Folsom Street, San Francisco; 907 First Avenue, Seattle; 45 North Fifth Street, Portland, Ore.

W-4 Westinghouse Electric and Manufacturing Co..... 6 50-52 East Broadway, Butte; Van Nuys Bldg., Los Angeles; Couch Bldg., Portland; 212 So. W. Temple, Salt Lake City; 165 Second Street, San Francisco; Second and Cherry Streets, Seattle; Paulsen Bldg., Spokane.

W-5 Westinghouse Machine Co..... 141 Second Street, San Francisco.

W-6 Westinghouse Lamp Co..... (See Westinghouse Electric and Manufacturing Co.)

W-8 Western Pipe & Steel Co..... 444 Market Street, San Francisco; 1758 North Broadway, Los Angeles.